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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/072,959	05/05/1998	PAI HUNG PAN	2919.IUS	7136

7590 01/11/2010
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EXAMINER

FOURSON III, GEORGE R

ART UNIT	PAPER NUMBER
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2823

MAIL DATE	DELIVERY MODE
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01/11/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/072,959	PAN, PAI HUNG	
	Examiner	Art Unit	
	George Fourson	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4,5,11,12,14-17,25-28 and 33-38 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5,11,12,14-17,25-28 and 33 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

A request for continued examination under 37 CFR 1.114 was filed in this application after a decision by the Board of Patent Appeals and Interferences, but before the filing of a Notice of Appeal to the Court of Appeals for the Federal Circuit or the commencement of a civil action. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on 10/26/09 has been entered.

Claims 1,2,4,11,12,14,16,25-27,33-35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al 5712185 in view of Lancaster 4835584.

Tsai et al discloses in figures 3a-3h and the accompanying description formation of dielectric layer material 32 and buffer layer material 34 over semiconductor substrate 30, patterning of layers 32 and 34, trench etching using the patterned layers 32 and 34 as a trench mask to form a trench that lack recesses (claim 1) and without recessing layer 32 relative to layer 34 (claim 11) (fig. 3D), optional thermal oxidation of the trench walls through disclosure of "usually performed" (col.3, lines 35 and 36), selective isotropic etching of layer 34, filling of the trench with silicon dioxide isolation material 40, removing portions of 40 from the remaining buffer layer 34 (fig.3H) and removing the remaining buffer layer 34 to expose sidewalls of an isolation structure protruding from the dielectric material and located laterally beyond sidewalls of the trench. During the

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process of removing 34 the thickness is reduced as in claims 4 and 14. Further, the references teaches as an alternative to the depicted process removal of layer 36A prior to deposition of the trench fill oxide (col.3, lines 33-34). In that embodiment the trench fill oxide would contact both the top major surface of the buffer layer 34 and the side surface of buffer layer 34. The reference discloses the purpose of the thermal oxidation of the trench walls to be "for relieving the defect resulting from the aforementioned etching process" which is removal of the nitride layer 34 (co1.3, lines 33-37). The reference does not disclose forming the oxide layer before the etching of layer 34.

Lancaster discloses that in removal of a nitride trench etch mask material with phosphoric acid, which is the etchant used in the removal of the nitride layer in the process of Tsai et al (col.3, line 22), the silicon of the trench may be attacked by the etchant and it is helpful to form sacrificial oxide 52a on the trench surfaces prior to nitride material removal (co1.3, lines 40-49).

It would have been within the scope of one of ordinary skill in the art to combine the teachings of Lancaster with those of Tsai et al to protect the trench surfaces of Tsai et al during removal of the nitride layer 34 in the process of Tsai et al to further provide trench wall surfaces that are free from damage. The function of the sacrificial oxidation step of Tsai et al would in that event be obtained by protecting the trench wall surfaces as disclosed by Lancaster.

Claims 17 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al in view of Lancaster as applied to claims 1,2,4,11,12,14,16,25-27,33-35 and 37 above, and further in view of the following comment.

Tsai et al discloses removal of 50-100 angstroms of buffer layer 34. In view of this disclosure, one of ordinary skill in the art would have been led to the recited amount of buffer layer 34 to be removed to achieve formation of desired device dimensions and resulting device characteristics on the finished wafer. Further, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225.

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Claims 5,15,28 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al in view of Lancaster as applied to claims 1,2,4,11,12,14,16,25-27,33-35 and 37 above, and further in view of Lee et al.

Tsai et al does not disclose densification of the trench fill material. Lee et al discloses densification of trench fill material (abstract, for example). It would have been within the scope of one of ordinary skill in the art to combine the teachings of the Tsai et al and Lee et al to enable the trench fill material of Tsai et al to be densified according to the teachings of Lee et al that the method is intended for trench fill dielectrics and to obtain the benefit disclosed by Lee et al of reduced oxide consumption in subsequent process steps (p.158, co1.1, lines 23-25).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to George Fourson whose telephone number is (571) 272-1860. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/George Fourson/
Primary Examiner, Art Unit 2823

GFourson
January 12, 2010